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NOTES ON THE BIOLOGY OF THE LOBSTER ;
A CORRECTION.

IN an article entitled 'Notes on the Biology of the Lobster' (SCIENCE N. S. Vol. I., No. 10, p. 263.) the following sentence occurs: "After hatching a brood in May, the female usually molts and afterwards extrudes a new batch of eggs." This should be corrected to read thus: *After hatching a brood in May, the female usually molts, but does not extrude a new batch of eggs until the following year.*

These notes were culled from a fuller paper, and this slip in the context crept in unobserved. It is, however, corrected in the latter part of the article.

FRANCIS H. HERRICK.

SCIENTIFIC LITERATURE.

THE TYRANNY OF THE MONISTIC CREED, A
REVIEW.

Der Monismus als Band zwischen Religion und Wissenschaft. Glaubensbekenntniss eines Naturforschers. ERNST HAECKEL. Bonn, Emil Strauss. 1893 (Vierte Auflage).

Monism. The Confession of Faith of a Man of Science. ERNST HAECKEL. Translated from the German by J. GILCHRIST. London, Adam and Charles Black. 1894.

The influence of a 'creed' on the progress of science is a proper subject for discussion by men of science, and it is to this, and not to the value of the basis for Haeckel's 'faith,' that we will direct attention.

As he defines it, Monism "is the conviction that there lives one spirit in all things and that the whole cognizable world is constituted, and has been developed, in accordance with one fundamental law."

This positive creed is very different from a modest confession of ignorance, which leaves us free to follow wherever future discoveries may lead, for the monistic creed

is based on the assumption that what we know is a proper measure of what we do not know, as if we could have any measure of the unknown.

An enthusiastic admirer of Haeckel's scientific researches may be pardoned a word of comment on this published statement of his creed.

He tells us all eminent and unprejudiced men of science who have the courage of their opinions think as he does. No one likes to be called a bigot or a coward, or to be accused of ignorance, but those who do not agree with Haeckel must fortify their souls by the thought that this argument is no new thing in history.

Science is justified by works and not by faith, and when Haeckel says 'Credo' and not 'Scio' we need not discuss the value of his belief, although its influence on the progress of science is a more practical matter.

The struggle for intellectual freedom is often called a conflict between religion and science, but while the men of science have burst through those Pillars of Hercules which, according to Bacon, are 'fixed by fate,' they have had no wish to demolish these ancient landmarks, but only to force a passage on to the great ocean of natural knowledge. Least of all do they desire to set up new bounds.

So far a creed involves, or seems to its holders to involve, preconceptions on matters which fall within the province of research or discovery, it is an obstacle to the progress of knowledge and a proper subject for scientific examination.

I shall try to show that the monistic 'confession of faith' has led to the discounting of the possibilities of future discovery, and that it has thus obstructed progress.

One of its results is intolerance of doubt on the problems of life. In this field the monist holds that those who are not with him are against him, and he admits no

middle ground. More freedom is permitted in other fields of thought.

We may say that, since we know nothing about it, we neither believe that the planet Mars is nor that it is not inhabited, but no such philosophic doubt is permitted in biology.

If a teacher of natural science were to say he does not believe life is the outcome of the physical and chemical properties of protoplasm he would most surely be reported as believing it *is not* the result of these properties, and he would straightway be branded a dangerous scientific heretic or a weak brother of the faith, and his confession of ignorance would be put on record as positive belief.

This antipathy to philosophic doubt on the problems of life is clearly due to the dogmatism of the monistic creed, which cannot admit the presence of any unjoined links in our knowledge of nature.

We might be indifferent to this intolerance if it did not cause the most essential characteristics of life to be ignored or pushed into the background.

It is as true now as it was in Bacon's day that: "Whoever, unable to doubt, and eager to affirm, shall establish principles proved, as he believes, . . . and according to the unmoved truth of these, shall reject or receive others, . . . he shall exchange things for words, reason for insanity, the world for a fable, *and shall be unable to interpret.*"

The essential characteristic of life is fitness.

A living organism is a being which *uses* the world around it for its own good.

I, for one, am unable to find, in inorganic matter, any germ of this wonderful attribute.

It is possible that after chemistry has given us artificial protoplasm this may be shaped, by selection or some other agency, into persistent adjustment to the shifting

world around it, and that it may thus become alive.

Everything is possible in the unknown, but why should we believe anything on the subject until we have evidence?

Of one thing we may be sure. The artificial production of protoplasm would not be a solution of the problem of life. The nature of the problem must be grasped in all its length and breadth, with all its difficulties, before we can hope to solve it.

Many biologists have sought to solve it by transforming Huxley's carefully guarded statement that protoplasm is the physical basis of life into the dogma that life is the sum of the physical properties of protoplasm.

Life cannot go on without food, and we may say with propriety that bread is the *staff* of life, but the agency which shapes the food into the specific structure of an organism exquisitely adapted to the conditions of the world around it is to be sought somewhere else than in the properties of bread.

One of the distinctive characteristics of this organizing agency is that it may exist in a germ without any visible organization. Another is that, so far as we know, it has been handed down, in an unbroken line, from the oldest living things, generation after generation, to the modern forms of life, and that it has leavened the whole hump of living matter.

While we know nothing of its nature or origin, and must guard against any unproved assumption, there seem, from our present standpoint, to be insuperable objections to the view that this agency is either matter or energy. While we know it only in union with protoplasm, it would seem that, if it is matter, it must, long ago, have reached the *minimum divisibile*. If it is energy, or wave motion, or perigenesis of plastidules, it is hard to understand why it has not been dissipated and exhausted. We know that it exists, and this is in itself a fact of the utmost moment.

We are told that the belief that it has, at some time, arisen from the properties of inorganic matter is a logical necessity, but the only logical necessity is that when our knowledge ends we should confess ignorance.

Young men who have been trained in the routine of the laboratory tell us all their interest in biology would be gone if they did not believe all its problems are, in the long run, to be resolved into physics and chemistry.

The only answer we can give them is that noble work has been done in natural science by men like Wallace, who believe that life is fundamentally different from matter, and also by men like Haeckel, who believe the opposite.

They also serve science who only stand and wait, and among them I would wish to be numbered.

While nothing is gained by giving a name to the unknown agency which is the essence of life, it is better to call it a 'vital principle' than to deny or ignore its existence. It is better to be called a 'vitalist,' or any other hard name by zealous monists, than to be convicted of teaching, as proved, what we know is not proven.

The word *vitality* is as innocent as *electricity* or *gravity*; in fact, Newton's use of this word led Leibnitz to charge him with infidelity to the spirit of science, although no one need fear to follow where Newton leads.

The older vitalists may have looked on a mere word as an explanation, but the reason the word has fallen into disrepute is the antagonism of the monists to the view that the problem of life presents any peculiar difficulties.

Many thoughtful men of science have held that the 'faith' of men like Haeckel ignores many of the data which are furnished by our scientific knowledge of the world around us.

Huxley, in his essay on the Physical

Basis of Life (1868), says it is necessary for a wise life to be fully possessed of two beliefs: "The first, that the order of nature is ascertainable by our faculties to an extent which is practically unlimited; the second, that our volition *counts for something as a condition of the course of events*. Each of these beliefs can be verified experimentally as often as we like to try."

Again, twenty-five years later (1893), he says (*Evolution and Ethics*) that, fragile reed as man may be, "there lies within him a fund of energy, operating intelligently, and *so far akin to that which pervades the universe that it is competent to influence and modify the cosmic process*."

Clearly this man of science has no overwhelming dread of the charge of anthropomorphism or animism, or of any charge except lack of caution.

I think that he would also admit that every living thing contains some small part of this influence which 'counts for something as a condition of the course of events,' and that it must be reckoned with in our attempts at a philosophy of the universe.

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The Life and Writings of Constantine Samuel Rafinesque. (Filson Club Publications No. 10.) Prepared for the Filson Club and read at its meeting, Monday, April 2, 1894. By RICHARD ELLSWORTH CALL, M. A., M. Sc., M. D. Louisville, Ky., John P. Morton & Co. 1895. 4to. pp. xiii + 227. Portraits, etc. Paper. Price \$2.50, net.

This sumptuous volume is published by a Historical Club in Louisville, Kentucky, as a memorial to one of the pioneer naturalists and explorers of the Ohio valley, a man whose brilliant intellect, eccentric character and unhappy fate will always cause his career to be looked upon with interest, and whose nervous and appalling industry has